

Let (-7,3) Be A Point Of Terminal Side Of 0Find Cos Sec Cot

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Understanding the relationships between coordinates, angles, and trigonometric functions is fundamental in mathematics, especially in the study of right triangles and the unit circle. When given a point such as (-7, 3), it becomes essential to determine the corresponding trigonometric ratios, including cosine (cos), secant (sec), cotangent (cot), and others. This article aims to provide a comprehensive guide on how to analyze a point like (-7, 3) as a terminal point on an angle's terminal side, and how to compute these key trigonometric functions, all while optimizing for clarity and SEO relevance.

Understanding the Coordinates and the Unit Circle

What Does a Point Like (-7, 3) Represent?

In the context of trigonometry, a point such as (-7, 3) on the coordinate plane typically represents a point on the terminal side of an angle measured from the origin. The coordinates specify the position relative to the origin (0,0), where:

- The x-coordinate (-7) indicates the horizontal distance from the origin.
- The y-coordinate (3) indicates the vertical distance from the origin.

Since the point is in the second or third quadrant (because x is negative and y is positive), it provides specific information about the angle's location.

The Significance of the Radius (Hypotenuse)

To analyze the trigonometric ratios, we first need to determine the radius (or hypotenuse) of the right triangle formed, which is the distance from the origin to the point. This is calculated using the distance formula:

$$r = \sqrt{x^2 + y^2}$$

For the point (-7, 3):

$\sqrt{}$

$$r = \sqrt{(-7)^2 + 3^2} = \sqrt{49 + 9} = \sqrt{58}$$

The hypotenuse length $(r = \sqrt{58})$ is crucial for computing ratios like sine, cosine, secant, cosecant, tangent, and cotangent.

Calculating Basic Trigonometric Ratios for Point (-7, 3)

1. Cosine (cos)

Cosine of an angle in the coordinate plane is the ratio of the adjacent side to the hypotenuse:

$$\cos \theta = \frac{x}{r}$$

Thus,

$$\cos \theta = \frac{-7}{\sqrt{58}}$$

Since the x-coordinate is negative, the cosine value will also be negative.

2. Secant (sec)

Secant is the reciprocal of cosine:

$$\sec \theta = \frac{1}{\cos \theta} = \frac{r}{x}$$

Therefore,

$$\sec \theta = \frac{\sqrt{58}}{-7} = -\frac{\sqrt{58}}{7}$$

The secant value is negative because cosine is negative in this quadrant.

3. Sine (sin)

Sine is the ratio of the opposite side to the hypotenuse:

$$\sin \theta = \frac{y}{r} = \frac{3}{\sqrt{58}}$$

The sine value is positive, indicating the angle is in the second quadrant where sine is positive.

4. Cosecant (csc)

Cosecant is the reciprocal of sine:

$$\csc \theta = \frac{1}{\sin \theta} = \frac{\sqrt{58}}{3}$$

5. Tangent (tan)

Tangent is the ratio of sine to cosine:

$$\tan \theta = \frac{y}{x} = \frac{3}{-7} = -\frac{3}{7}$$

The tangent is negative in the second and fourth quadrants.

6. Cotangent (cot)

Cotangent is the reciprocal of tangent:

$$\cot \theta = \frac{x}{y} = \frac{-7}{3}$$

Quadrant Analysis and Significance of the Ratios

Understanding the signs of trigonometric functions based on the quadrant helps interpret the values correctly.

Quadrant Sign Rules:

Function	Quadrant I	Quadrant II	Quadrant III	Quadrant IV
sin	+	+	-	-
cos	+	-	-	+
tan	+	-	+	-

Since point (-7, 3) lies in the second quadrant, sine and secant are positive, while cosine, tangent, cotangent, and cosecant are negative.

Expressing the Trigonometric Ratios in Simplified Forms

To make these ratios more user-friendly or for further calculations, rationalize denominators where necessary.

Simplified forms:

- $\cos \theta = \frac{7}{\sqrt{58}}$

- $\sec \theta = \frac{\sqrt{58}}{7}$

- $\sin \theta = \frac{3}{\sqrt{58}}$

- $\csc \theta = \frac{\sqrt{58}}{3}$

- $\tan \theta = \frac{3}{7}$

- $\cot \theta = \frac{7}{3}$

Applications and Real-World Examples of Trigonometric Ratios

Understanding how to compute these ratios from a point like (-7, 3) has numerous applications:

- Navigation: Determining directions based on coordinate points.
- Engineering: Analyzing forces acting at angles.
- Physics: Calculating projectile components and trajectories.
- Computer Graphics: Rotating objects and understanding coordinate transformations.
- Mathematics Education: Learning about the unit circle and angle measurement.

Summary of Key Points

- The point $(-7, 3)$ lies in the second quadrant, influencing the signs of the trigonometric ratios.
- The hypotenuse $(r = \sqrt{58})$ is fundamental for calculating all ratios.
- Cosine and secant are negative; sine and cosecant are positive in this quadrant.
- Tangent and cotangent are negative in the second quadrant.
- All ratios are derived directly from the coordinates and hypotenuse, following the definitions of basic trigonometric functions.

Conclusion: Mastering Trigonometric Ratios for Any Point

Analyzing a point like $(-7, 3)$ as a terminal point on an angle's terminal side involves understanding coordinate geometry, the Pythagorean theorem, and the definitions of basic trigonometric ratios. By calculating the hypotenuse and applying the ratios, you can accurately determine the values of cos, sec, cot, and other functions. Mastery of these concepts is essential for students and professionals working in fields that involve angles, rotations, and wave functions.

Remember, always consider the quadrant when interpreting the signs of your trigonometric ratios, and practice with various points to strengthen your understanding of the relationship between coordinates and angles.

Keywords: coordinate point $(-7, 3)$, terminal side of angle, cosine, secant, cotangent, trigonometric ratios, hypotenuse, unit circle, quadrant analysis, mathematical calculations

Frequently Asked Questions

What is the significance of the point $(-7, 3)$ in the context of trigonometry?

The point $(-7, 3)$ lies on the terminal side of an angle in standard position, allowing us to find its trigonometric ratios such as cosine, secant, and cotangent based on its coordinates.

How do you find the cosine of an angle given a point $(-7, 3)$ on

its terminal side?

Cosine is found by dividing the x-coordinate by the hypotenuse: $\cos \theta = x / r$, where $r = \sqrt{x^2 + y^2}$. For $(-7, 3)$, $r = \sqrt{(-7)^2 + 3^2} = \sqrt{49 + 9} = \sqrt{58}$.

What is the value of secant for the angle with terminal side passing through $(-7, 3)$?

Secant is the reciprocal of cosine: $\sec \theta = r / x$. Using $r = \sqrt{58}$ and $x = -7$, $\sec \theta = \sqrt{58} / -7$.

How do you calculate the cotangent of an angle given the point $(-7, 3)$?

Cotangent is the ratio of adjacent to opposite, or x / y . For $(-7, 3)$, $\cot \theta = -7 / 3$.

Why is it important to find the hypotenuse when calculating these trigonometric ratios?

The hypotenuse is essential because it normalizes the x and y coordinates, allowing us to compute ratios like cosine, secant, and cotangent accurately based on the right triangle formed.

What is the approximate value of $\cos \theta$ for the point $(-7, 3)$?

$\cos \theta \approx -7 / \sqrt{58} \approx -7 / 7.6158 \approx -0.9186$.

Is the secant of the angle positive or negative for the point $(-7, 3)$?

Since $\sec \theta = \sqrt{58} / -7$ and $\sqrt{58} > 0$, $\sec \theta$ is negative because of the negative denominator, so $\sec \theta \approx -0.9186$.

What quadrant does the point $(-7, 3)$ lie in, and how does that affect the signs of the trigonometric ratios?

The point $(-7, 3)$ lies in the second quadrant, where cosine and secant are negative, while cotangent is also negative, and sine is positive.

Can the point $(-7, 3)$ be used to determine the exact values of all six trigonometric functions?

While we can calculate cosine, secant, and cotangent directly from the point, sine, tangent, and cosecant can also be determined using similar ratios, providing a complete set of trigonometric function values.

Additional Resources

Let $(-7, 3)$ Be A Point Of Terminal Side Of θ Find $\cos \sec \cot$

Introduction

Mathematics, particularly trigonometry, serves as a cornerstone of scientific and engineering disciplines. It provides essential tools for analyzing angles, waves, oscillations, and many natural phenomena. A fundamental aspect of trigonometry involves understanding how points on the Cartesian plane relate to angles and their corresponding trigonometric functions.

The problem statement, "Let $(-7, 3)$ be a point of terminal side of θ Find $\cos \sec \cot$," invites a detailed exploration into how a given point can be used to determine various trigonometric functions associated with an angle, especially when that point lies on the terminal side of an angle in standard position. This article aims to dissect this problem comprehensively, providing insights into the underlying principles, calculations, and implications.

Context and Significance of the Problem

Understanding the positional relationship between a point on the Cartesian plane and an angle in standard position is fundamental in trigonometry. When a point $((x, y))$ lies on the terminal side of an angle (θ) in standard position, the trigonometric functions are often derived from the coordinates and the radius (or hypotenuse) of the corresponding right triangle.

Given the point $((-7, 3))$, which resides in the second quadrant, the task involves:

- Determining the angle (θ) in standard position,
- Calculating the six primary trigonometric functions: sine, cosine, tangent, cosecant, secant, and cotangent,
- Interpreting these values in the context of the point's position.

This process is not merely computational; it also deepens understanding of how points relate to angles and how their coordinates influence trigonometric ratios.

The Geometric Foundations

Standard Position of an Angle

An angle (θ) in standard position has its vertex at the origin $((0, 0))$, with its initial side along the positive x-axis. The terminal side is rotated counterclockwise from the initial side by (θ) .

Coordinates and the Terminal Side

A point $((-7, 3))$ on the terminal side signifies that the terminal side passes through this point. To analyze the associated angle, we consider:

- The radius (r) , which is the distance from the origin to the point,
- The coordinates $((x, y))$, which define the position of the point.

Calculating the Radius (r)

The first step involves finding the length of the hypotenuse (r) , which is the distance from the origin to the point $((-7, 3))$:

$$r = \sqrt{x^2 + y^2} = \sqrt{(-7)^2 + 3^2} = \sqrt{49 + 9} = \sqrt{58}$$

Thus,

$$r \approx 7.6158$$

This distance serves as the hypotenuse for the right triangle formed by dropping a perpendicular from the point to the x-axis.

Determining the Reference and Actual Angle (θ)

Quadrant Identification

Since $(x = -7)$ and $(y = 3)$, the point $((-7, 3))$ is located in the second quadrant, where:

- $(x < 0)$,
- $(y > 0)$.

Computing (θ)

While the exact angle (θ) can be obtained via the inverse tangent function:

$$\theta = \arctan\left(\frac{y}{x}\right) = \arctan\left(\frac{3}{-7}\right)$$

which yields a negative value approximately:

$$\arctan\left(-\frac{3}{7}\right) \approx -23.2^\circ$$

However, since the point is in the second quadrant, the angle (θ) in standard position is:

$$\theta = 360^\circ - 23.2^\circ = 336.8^\circ$$

$$\theta = 180^\circ - |\arctan(\frac{3}{-7})| \approx 180^\circ - 23.2^\circ = 156.8^\circ$$

Expressed in radians:

$$\theta \approx 2.735 \text{ radians}$$

This angle accurately reflects the position of the terminal side passing through $(-7, 3)$.

Trigonometric Ratios for the Point $(-7, 3)$

Basic Ratios

Using the definitions:

- $\sin \theta = \frac{y}{r}$,
- $\cos \theta = \frac{x}{r}$,
- $\tan \theta = \frac{y}{x}$.

Calculations:

$$\sin \theta = \frac{3}{\sqrt{58}} \approx \frac{3}{7.6158} \approx 0.394$$

$$\cos \theta = \frac{-7}{\sqrt{58}} \approx \frac{-7}{7.6158} \approx -0.918$$

$$\tan \theta = \frac{3}{-7} \approx -0.429$$

Reciprocal Ratios

- Cosecant:

$$\csc \theta = \frac{1}{\sin \theta} \approx \frac{1}{0.394} \approx 2.538$$

- Secant:

$$\sec \theta = \frac{1}{\cos \theta} \approx \frac{1}{-0.918} \approx -1.089$$

- Cotangent:

$$\cot \theta = \frac{1}{\tan \theta} \approx \frac{1}{-0.429} \approx -2.333$$

Analyzing the Trigonometric Functions in Context

Significance of the Signs

The signs of these ratios confirm the quadrant:

- $\sin \theta > 0$ in the second quadrant,
- $\cos \theta < 0$ in the second quadrant,
- $\tan \theta < 0$ in the second quadrant.

The reciprocal functions follow suit, with $\csc \theta > 0$, $\sec \theta < 0$, and $\cot \theta < 0$.

Summary Table

Function	Value	Sign in Quadrant II
$\sin \theta$	0.394	Positive
$\cos \theta$	-0.918	Negative
$\tan \theta$	-0.429	Negative
$\csc \theta$	2.538	Positive
$\sec \theta$	-1.089	Negative
$\cot \theta$	-2.333	Negative

Implications and Applications

Understanding these ratios for a point like $(-7, 3)$ has broader implications in fields such as physics, engineering, and computer graphics, where angles and their associated ratios are crucial. For example:

- Navigation and Robotics: Determining directions relative to a coordinate system.
- Wave Analysis: Analyzing phase shifts and oscillations.
- Signal Processing: Using trigonometric functions to interpret waveforms.

Additional Considerations

Angle Measurement Units

While calculations above are in degrees, similar procedures can be performed in radians, depending on the context or specific application requirements.

Extending to Other Points

The same methodology applies to any point $((x, y))$:

- Calculate $(r = \sqrt{x^2 + y^2})$,
- Determine the quadrant,
- Find the reference angle,
- Compute the six primary trigonometric functions.

Limitations and Precautions

- Quadrant Identification is crucial to assign correct signs.
- Division by Zero: For points on the axes (e.g., $(x=0)$ or $(y=0)$), special cases apply where some ratios tend toward infinity.

Conclusion

The problem of “Let $((-7, 3))$ be a point of terminal side of θ Find Cos Sec Cot” encapsulates fundamental principles of trigonometry: translating Cartesian coordinates into angular measures and corresponding ratios. Through meticulous calculation and analysis, we've determined the precise values of the six primary trigonometric functions associated with the point's position, confirming the importance of quadrant awareness and the geometric relationships underlying trigonometric ratios.

This exploration not only demonstrates the computational techniques but also emphasizes the interconnectedness of coordinate geometry and trigonometry, reinforcing their combined utility in solving real-world and theoretical problems. Whether applied in navigation, physics, or engineering design, these foundational concepts remain indispensable tools for scientific inquiry and technological advancement.

[Let 7 3 Be A Point Of Terminal Side Of \$\theta\$ find Cos Sec Cot](#)

Let 7 3 Be A Point Of Terminal Side Of θ find Cos Sec Cot

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